

Remarks/Arguments

Claim 21 was objected to for antecedent basis related to "the liquid water" recitation. Claim 21 has been amended to rectify this error.

Applicants' affirm election to prosecute claims 1-21. As such, Applicants withdraw claims 22-24 without prejudice to filing a subsequent Divisional application.

Claims 1-8, and 10-19 are rejected under 35 U.S.C. § 102(e) as being anticipated by Borup (U.S. 6,521,204).

Claims 9, 20, 21 are rejected under 35 U.S.C. §103(a) as being unpatentable over Borup.

Claims 1 and 12 are amended to recite an oxygen to carbon ratio of greater than 0.7 and less than two. Support for this limitation is found on page 12, lines 3-5 and page 18, line 18 of the specification. Claims 1 and 12 are also amended to recite production of 20-30 volume percent hydrogen gas concentrations in final reformat gas in less than 60 seconds. Support for these added limitations are found on page 6, line 5, page 18 lines 4-16, and FIG. 12 of the specification.

Claim 7 has been canceled with its oxygen/carbon fuel ratios now recited in claim 1.

Claim 9 has been amended to recite hydrogen gas production times of less than 30 seconds. Support for this limitation is found on page 6, line 6 of the specification.

The specification has been amended to correct grammatical errors. The paragraph starting on page 14, line 25 is amended so that the time durations stated therein correspond to FIG. 3 to which the paragraph relates. No new matter has been added to the specification as a result of these amendments.

Applicants' Invention

Applicants claim a process for bringing a fuel processor up to its operating temperature. A salient feature of the invention is partial oxidation of reform gas. This partial oxidation is required to provide measured, selective heating of various thermal spaces of the instant method/device, by generating heat at various points along the reprocessing endeavor. During this boot-up process, oxygen/carbon ratios are at

between 0.7 and 2. The warm-up process takes less than 60 seconds, and often less than 30 seconds and results in a concentration of between 20 and 30 volume percent hydrogen gas in any final reformat stream produced.

Borup Does Not
Produce Steam

Claims 1-8, and 10-19 are rejected under 35 U.S.C. § 102(e) as being anticipated by Borup (U.S. 6,521,204). In light of the foregoing amendments to the claims, Borup is not applicable. Applicants request withdrawal of the rejections based on Borup.

Unlike the Applicants' invention as originally claimed, Borup does not *produce* steam. Rather, as noted in Column 4, line 8) steam is *introduced with the fuel* at the beginning of Borup's reformation protocol. Borup uses steam (supplied with its fuel) to cool off catalysts after its initial lean burn program.

Furthermore, steam production is endothermic. Inasmuch as Borup's objective is to develop a head of intense heat to elevate temperatures of its downstream componentry, applicant's production of steam as originally claimed would obviate Borup's objective

Also, Borup does not mix air with carbon monoxide and hydrogen during start up, as originally claimed in clause 1b of the instant method. Rather, Borup's carbon monoxide reacts only with oxygen in its PROX step (applicant's clause 1d) in efforts to eliminate residual carbon monoxide so as to prevent fuel cell poisoning (Column 4, lines 35-38).

In light of the fact that Borup does not produce steam, and that Borup does not react air with carbon monoxide and hydrogen to produce heat, Applicants respectfully request withdrawal of the §102 rejection and allowance of claims 1-8 and 10-19.

Borup Teaches Away
From Partial Oxidation
Associated with Low O/C Ratios

Claims 9, 20, 21 are rejected under 35 U.S.C. §103(a) as being unpatentable over Borup. In light of the traversal related to the §102 rejection above, Applicants

submit that Borup is not a relevant §103(a) rejection. Withdrawal of said rejection and allowance of the claims is respectfully solicited.

Notwithstanding the aforementioned traversal, Applicant disagrees with Borup's use as a §103(a) reference. Nowhere does Borup either anticipate or suggest a 30 second hydrogen gas production period as now recited in claim 9. Borup cannot produce hydrogen in less than 60 seconds (Borup requires 2500 seconds and only after it enters a "rich" burn sequence.)

The instant method requires partial oxidation (i.e., "rich" fuel mixtures) so as to assure near instantaneous production of hydrogen gas. (See FIG. 12 showing highest H₂ concentrations within 30 seconds of start-up.) As now recited, the instant method is relegated to oxygen/carbon (O/C) ratios at greater than 0.7 and less than two.

In contrast, Borup requires "lean" fuel mixtures (see Abstract) at the outset of its process. Borup's O/C ratios are 5 to 10 times higher than applicants'. Specifically, and as stated in column 7, lines 62-65, Borup requires O/C ratios of 10:1. As a result, and as can be seen in Borup's FIG. 6, hydrogen is not produced until approximately 2500 seconds into the process. Instead, Borup must swing from lean to rich fuel mixtures to finally produce Hydrogen in a three step process. First, Borup generates a tremendous amount of heat via complete oxidation, then Borup applies steam (supplied from outside its system) to cool its catalysts, then Borup resorts to a rich mixture to finally produce hydrogen gas.

To wit, Borup states as follows:

"After sufficient heating of the reactor by the lean mixture, a fuel-rich stream is fed to the reactor...The reactions of the fuel-rich stream produce a product comprising Hydrogen." (Column 2, lines 42-49)

Borup differs from the instant process where O/C ratios are relegated to no higher than 2 in the instant process. This partial oxidation environment controls heat generation of the exothermic processes, which facilitates the zonal heating features of

the instant method. The hydrogen initially produced at the beginning of the process is partially oxidized at various injection points to raise temperatures to facilitate water gas reactions. Borup cannot produce heat along the way because all of its fuel is oxidized to CO₂ and water up front.

Modifying Borup to a "rich" fuel burn would prevent Borup's objective of building heat all up front to heat components downstream. If a prior art reference is cited that requires some modification in order to meet the claimed invention and such modification destroys the purpose of the invention disclosed in the reference, one of ordinary skill in the art would not find reason to make the proposed modification. In re Gordon 733 F. 2d 900 (Fed. Cir 1984).


The instant process produces hydrogen gas right away. Part of this hydrogen gas is oxidized and the heat generated therefrom facilitates production of steam, as originally claimed. Per equations 2 and 3 of the instant specification, subsequent reaction with steam converts carbon monoxide (itself a product of rich burn) to carbon dioxide and hydrogen.

In light of the fact that Borup does not utilize solely "rich" fuel mixtures as now claimed by the Applicants, and that the instant process results in hydrogen gas-rich reformat gas in 30-60 seconds, as opposed to Borup's 2500 seconds, applicant's request that the §§ 102 and 103 rejections be withdrawn and the claims allowed.

An earnest attempt has been made hereby to respond to the January 26, 2007 Official Action in the above-identified matter. All claims are in condition for allowance. If the Examiner feels that a telephonic interview will expedite allowance, he is respectfully urged to contact the undersigned. Claims 1-6, and 8-21 are currently pending.

Respectfully solicited,

CHERSKOV & FLAYNIK


Michael J. Cherskov (33,664)